



*INL researchers are leading national efforts to secure wireless systems, including 5G cellular.*



## Wireless Research Capabilities

### WIRELESS SECURITY INSTITUTE

Fifth-generation wireless technology, commonly referred to as 5G, promises to deliver a technology revolution in wireless communication. Already, wireless carriers and equipment manufacturers are incorporating 5G capabilities in their devices and working to construct national 5G networks. As 5G moves forward, a national challenge will emerge to develop and validate 5G security protocols and data protection technologies.

In response to this national challenge, Idaho National Laboratory has established the INL Wireless Security Institute to lead and coordinate government, academic, and private industry research efforts fostering more secure and reliable 5G wireless technology. The institute

draws on INL's extensive expertise and unique facilities that have been used for nearly two decades to analyze, design, test, and improve cellular, radio, and satellite communication systems for government agencies and global wireless communication companies.

The rollout of 5G technology is proceeding at a rapid pace. Coordination and collaboration among designers, manufacturers, service providers, and users to ensure security and resiliency of individual devices, the network, and applications is critical.

### SPECTRUM INNOVATION

At INL our researchers are supporting directed research and development, emerging spectrum sharing technology, engineering analyses, and technology testing, to support the acceleration of 5G technology and its

secure use. INL researchers have created multiple waveforms and novel spectrum-analysis systems. Two examples are the dynamic spectrum-agile, jam-resistant waveform, Wireless Spectrum Communications technology, a real-time spectrum-monitoring system capable of extreme broadband monitoring and high-speed signal analysis and decomposition, and the Wireless Radio Frequency Signal Identification and Protocol Reverse Engineering technology. The INL research team has been actively researching 5G security including applications in the mmWave RF-spectrum bands. INL researchers are capable of analyzing and testing unmanned aerial system drones employing cellular 4G technology.

Lab researchers collaborate with wireless research teams from several universities: the



*INL's wireless test range supports government, industry, and academic testing and training.*

#### FOR MORE INFORMATION

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analyzers, oscilloscopes, various software-defined radio waveform-development tools, and RF record and playback systems. The laboratory also manages a variety of electronic-design-automation development tools.

#### **WIRELESS TEST RANGE**

Idaho's isolated, high-desert landscape provides an ideal location for open-air experimentation with wireless technology. INL maintains one of the nation's largest and most diverse wireless communications test and evaluation ranges, equipped with nearly all communications test and evaluation capabilities up through 4G cellular.

Situated in a low-noise environment, this spectrum allows our engineers to test devices and hardware ranging from high-frequency, ultra-high-frequency, cellular, satellite, microwave, and everything in between. INL's capabilities include Tier 1, end-to-end second, third, and fourth-generation cellular networks with fixed and mobile towers, stand-alone WIMAX (mobile and fixed) WiFi, Zigbee, and Bluetooth networks. INL wireless

communications experts design, install, and test next-generation communications systems. Wireless devices, sensors, and communications systems are rapidly being incorporated into privately owned critical infrastructure systems. As an internationally recognized leader in control systems cybersecurity and grid reliability, the laboratory can study, model, and perform unbiased, full-scale tests that illustrate the impacts of wireless failures in industrial processes.

This test range environment allows lab researchers and customers the ability to mimic real deployed systems and provide analysis. Vulnerabilities, consequences, and solutions can be created, explored, and tested in a full-scale, open-air environment. This data can also be incorporated into training or used to support the development of science-based policy that prevents cascading failures across multiple infrastructures.

#### **QUICK FACTS**

1. Since 2003, INL has operated a comprehensive wireless test range spread across 890 square miles of isolated, federally owned land.
2. INL is authorized by the NTIA to operate as an experimental radio station enabling local authority and management of frequency on a noninterference basis with local spectrum users.
3. INL has experienced communications engineers working across the cellular, WiMax, HF, UHF, radar, antenna, and satellite fields.
4. Lab researchers have developed award-winning, patented technologies in wireless security including the Wireless Spectrum Communications (WSComm) system and the Wireless Radio Frequency Signal Identification and Protocol Reverse Engineering (WiFIRE) system.